

REMARKS

This application has been carefully reviewed in light of the Office Action dated May 20, 2004. Claims 1, 3 to 7 and 12 are pending in the application, with Claims 2, 8 to 11 and 13 to 17 having been cancelled. Claims 1, 3 to 5, 7 and 12 have been amended and Claims 1, 7 and 12 are in independent form. Reconsideration and further examination are respectfully requested.

Claim 1 was rejected under 35 U.S.C. § 112, second paragraph, for alleged indefiniteness. Specifically, the Office Action contended that only a single characteristic point is extracted, but that an edge is detected based on multiple characteristic points. In addition, the Office Action alleged that there is insufficient antecedent basis for "said characteristic points." In response, Claim 1 has been amended to more clearly define the invention. Reconsideration and withdrawal of the rejection are respectfully requested.

Claims 1 to 14, 16 and 17 were rejected under 35 U.S.C. § 103(a) over U.S. Patent No. 5,343,390 (Doi) in view of U.S. Patent No. 4,962,539 (Takeo). Claims 2, 8 to 11 and 13, 14, 16 and 17 have been cancelled without prejudice or disclaimer of subject matter and without conceding the correctness of their rejection. Reconsideration and withdrawal of the rejection of the remaining claims are respectfully requested.

The present invention generally concerns extracting an irradiation field from a radiation image. Among its many features, the invention provides for (i) obtaining, in pixel groups in the radiation image, a pattern for each pixel, the pattern being determined by pixel values of a plurality of pixels selected based on coordinates of the pixels, (ii) assigning a score to each pixel based on the pattern, (iii) assigning, in line segment groups in the radiation image, the summation of the scores of the pixels existing on a line segment

as a score to the line segment, and (iv) selecting a line segment as an irradiation field edge based on the score of the line segment in the line segment group.

By virtue of the foregoing, the influence of noise on the summation of a score on a line segment is reduced, thus yielding more accurate detection of irradiation field edges.

Referring specifically to the claims, independent Claims 1, 7 and 12 as amended respectively define the invention in terms of method, apparatus and recording medium.

The applied art is not seen to disclose or to suggest the features of the invention of the subject application. In particular, the Doi and Takeo patents are not seen to disclose or suggest at least the features of (i) obtaining, in pixel groups in the radiation image, a pattern for each pixel, the pattern being determined by pixel values of a plurality of pixels selected based on coordinates of the pixels, (ii) assigning a score to each pixel based on the pattern, (iii) assigning, in line segment groups in the radiation image, the summation of the scores of the pixels existing on a line segment as a score to the line segment, and (iv) selecting a line segment as an irradiation field edge based on the score of the line segment in the line segment group.

As understood by Applicants, Doi discloses an method and system for selecting a large number of adjacent regions of interest (ROIs) covering a large peripheral portion of a lung image in a digitized chest radiograph. The peripheral lung regions are identified based on the automated detection of lung apices, ribcage and diaphragm edges. A large number of ROIs are selected sequentially by filling in of the identified peripheral regions. The number of ROIs is selected in order to nearly completely fill in the area of each identified peripheral region and thus cover a large portion of the patient's lungs. An

edge gradient analysis is performed in order to determine those ROIs with sharp edges, i.e., those which exhibit high edge gradients with standard deviation values above a predetermined threshold value or in a selected upper percentage of all calculated standard deviations. See Doi, column 3, lines 20 to 36.

Although Doi discloses selecting a large number of ROIs in a digitized chest radiograph, the Office Action conceded that Doi does not teach detecting patterns in a radiograph image. As a consequence, Doi could not possibly describe (i) obtaining, in pixel groups in the radiation image, a pattern for each pixel, the pattern being determined by pixel values of a plurality of pixels selected based on coordinates of the pixels, (ii) assigning a score to each pixel based on the pattern, (iii) assigning, in line segment groups in the radiation image, the summation of the scores of the pixels existing on a line segment as a score to the line segment, and (iv) selecting a line segment as an irradiation field edge based on the score of the line segment in the line segment group.

Takeo was cited for its alleged disclosure of detecting patterns in a radiograph image. As understood by Applicants, Takeo discloses a method for recognizing the layout pattern of radiation images comprising the steps of preparing two-valued masks, each composed of a two-valued signal representing a layout pattern for radiation images which are to be stored on a stimuable phosphor sheet, and obtaining a preliminary read-out image signal by carrying out preliminary read out on a stimuable phosphor sheet on which radiation images have been stored. The layout pattern of the radiation images is recognized by converting the preliminary read-out image signal into a two-valued image signal, calculating rating values, which represent the degree of pattern matching between the two-valued image signal and the two-valued masks, finding the highest rating value that represents the highest degree of pattern matching among the rating values, and comparing

the highest rating value with a predetermined value representing a predetermined degree of pattern matching. See Takeo, Abstract, column 6, lines 7 to 15.

As such, Takeo is not seen to assign a score to each pixel based on a pattern, and to additionally assign a score to line segments based on the summation of the scores of the pixels. Rather, Takeo assigns rating values that represent the degree of pattern matching between a two-valued image signal and two-valued masks. Accordingly, Takeo is not seen to disclose or suggest (i) obtaining, in pixel groups in the radiation image, a pattern for each pixel, the pattern being determined by pixel values of a plurality of pixels selected based on coordinates of the pixels, (ii) assigning a score to each pixel based on the pattern, (iii) assigning, in line segment groups in the radiation image, the summation of the scores of the pixels existing on a line segment as a score to the line segment, and (iv) selecting a line segment as an irradiation field edge based on the score of the line segment in the line segment group.

Accordingly, based on the foregoing amendments and remarks, independent Claims 1, 7 and 12 as amended are believed to be allowable over the applied references

The other claims in the application are each dependent from the independent claims and are believed to be allowable over the applied references for at least the same reasons. Because each dependent claim is deemed to define an additional aspect of the invention, however, the individual consideration of each on its own merits is respectfully requested.

No other matters being raised, it is believed that the entire application is fully in condition for allowance, and such action is courteously solicited.

Applicants' undersigned attorney may be reached in our Costa Mesa,
California office at (714) 540-8700. All correspondence should continue to be directed to
our below-listed address.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Michael K. O'Neill", is written over a horizontal line.

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